

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
31 January 2002 (31.01.2002)

PCT

(10) International Publication Number  
**WO 02/08830 A1**

- (51) International Patent Classification<sup>7</sup>: **G03B 21/20**
- (21) International Application Number: **PCT/KR01/01204**
- (22) International Filing Date: **13 July 2001 (13.07.2001)**
- (25) Filing Language: **English**
- (26) Publication Language: **English**
- (30) Priority Data:  
2000/41894      21 July 2000 (21.07.2000)      **KR**
- (71) Applicant (for all designated States except US): **LG ELECTRONICS, INC. [KR/KR]; 20, Yoido-dong, Youngdungpo-gu, Seoul 150-875 (KR).**

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

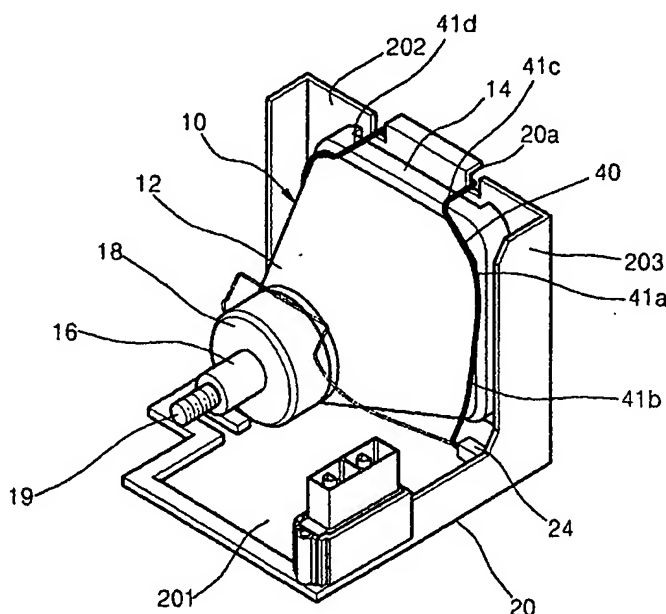
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **SHIN, Jong-Hoon [KR/KR]; LG Electronics, Inc., 206-1005 Woobangsin-segae APT, 753-52 sangmo-dong, Kumi 730-120 (KR).**
- (74) Agent: **HAW, Yong-Noke; 8th Fl. Songchon Bldg. 642-15 Yoeksam-dong, Kangnam-ku, Seoul 135-080 (KR).**

**Published:**

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: **LAMP MOUNTING STRUCTURE**



(57) Abstract: Disclosed is a mounting structure for a lamp comprising a lamp having a funnel, a frame attached to a front end of the funnel and a connecting bolt provided at a rear portion of the funnel a lamp holder, which is adapted to hold the lamp therein while maintaining a desired lateral gap at each side of the frame of the lamp, have a bottom plate, a front plate and a pair of side plates. The lamp mounting structure maintains an alignment of the optical axis of the lamp while effectively preventing the lamp from being damaged due to a thermal expansion thereof.

WO 02/08830 A1



---

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## LAMP MOUNTING STRUCTURE

## Technical Field

The present invention relates to a lamp mounting structure, and more particularly to a lamp mounting structure which is capable of correctly aligning the optical axis of a lamp while preventing a lamp from being damaged even when it is overheated, thereby enhancing stability in the operation of the lamp and an improved convenience in association with the use of the lamp. In particular, the present invention can be effectively employed to the cases in which the alignment of the optical axis of a lamp is important, such as in lamp mounting structures of projectors.

## 15 Background Art

Generally, a display device using a projection system mainly includes a projector for projecting light retaining an image signal, and a screen for reflecting the light projected from the projector, thereby displaying an image. The projector mainly includes a lamp for performing a light emitting function, a plurality of dichroic mirrors for selectively reflecting or transmitting the light (white light) emitted from the lamp, a liquid crystal panel for receiving light beams separated from the light by the dichroic mirrors, thereby

forming an image while controlling the amount of light incident on each pixel thereof, and projection lens for projecting the image formed by the liquid crystal panel while enlarging the image.

5           The lamp is an essential component of the projector since it determines the basic performance of the projector such as the brightness and color of the image projected onto the screen. Figs. 1 and 2 illustrate an example of such a lamp. Referring to Figs. 1 and 2, the lamp, which is denoted by the  
10           reference numeral 10, includes a funnel 12 serving as a mirror, a frame 14 attached to the front end of the funnel 12, an iron core 16 arranged at the rear portion of the funnel 12, a neck 18 adapted to partially surround the iron core 16, and a connecting bolt 19 protruded from the iron core 16. The iron  
15           core 16 is made of a metal material such as iron. The iron core 16 is mounted on the neck 18 by a gypsum material interposed therebetween.

          The brightness and color of the image displayed by the projector are greatly varied, depending on the direction of the  
20           light emitted from the lamp 10. Accordingly, it is necessary to firmly maintain the mounted state of the lamp 10. To this end, the lamp 10 is firmly and accurately mounted by a lamp holder 20 in order to prevent the optical axis of the lamp 10 from being miss-aligned in longitudinal, vertical, and lateral

directions (the directions of X, Y, and Z axes in Fig. 1).

The lamp holder 20, which serves as a mounting structure of the lamp 10, has a bottom plate 201, a front plate 202, and a pair of side plates 203. The guide plates 22 are placed at the both sides of the front plate 202 to fasten the right and left sides of the frame 14 to the lamp holder 20. Vertically-extending guide plates 22 are provided at the rear surface of the front plate 202 and at both sides of the front plate 202, respectively. The guide plates 22 serve to the frame 14 of the lamp 10, thereby holding the lamp 10 in the longitudinal and lateral directions (X and Z-axis directions). The lamp holder 20 also has a strip-shaped holding plate 30 mounted between the side plates 203 over the frame 14 of the lamp 10 fitted between guide plates 22 to hold the lamp 10 in the vertical direction (Y-axis direction). Both ends of the holding plate 30 are fitted in slots 203a respectively formed at the side plates 203.

By virtue of such a conventional lamp mounting structure having the above mentioned configuration, movements of the lamp 10 in lateral directions (X-axis direction) are restricted by the guide plates of the lamp holder 20, and movements of the lamp 10 in vertical directions (Y-axis direction) are restricted by the holding plate 30. Also, movements of the lamp 10 in longitudinal directions (Z-axis direction) are restricted

by the front plate 202 of the lamp holder 20 and stoppers each provided at the lower end of an associated one of the guide plates 22. Thus, the movements of the lamp 10 are restricted preventing the optical axis of the lamp 10 from the miss-  
5 alignment in any direction.

Meanwhile, heat generated as a result of a high temperature (about 300 °C or above) at the lamp 10 due to the operating characteristics of the lamp 10. This heat serves to over-heat the lamp 10, thereby causing the funnel 12 and frame  
10 14 to expand. When the funnel 12 and frame 14 are expanded excessively, an excessive pressure is applied to the funnel 12 by the lamp holder 20 since the lamp 10 is placed in between the guide plates 22 of the lamp holder 20 which may result in crack of the funnel 12 or neck 18 may be cracked.

15 If the width L2 of the space defined between the guide plates 22 is increased in order to prevent the lamp 10 from being damaged due to a thermal expansion as described above, then the lamp 10 may move laterally while in a normal state resulting in a miss-alignment of the optical axis thereof. And,  
20 there may be a degraded uniformity of the image displayed on the screen. In particular, the miss-alignment of the optical axis causes the image displayed on the screen to undesirably exhibit excessive yellow color at the periphery thereof.

## Disclosure of invention

Therefore, the present invention has been made in view of the above mentioned problems, and an object of the invention is to provide a lamp mounting structure for a projector which is capable of maintaining a desired alignment of the optical axis of a lamp included in the projector while allowing the lamp to move in some extent, thereby preventing the lamp from being cracked due to an expansion caused by an excessive heat, thus achieving an improved stability in the operation of the lamp.

In accordance with the present invention, this object is accomplished by providing a mounting structure for a lamp comprising: a lamp having a funnel, a frame attached to a front end of the funnel, and a connecting bolt provided at a rear portion of the funnel; a lamp holder, which is adapted to hold the lamp therein while maintaining a desired lateral gap at each side of the frame of the lamp, have a bottom plate, a front plate and a pair of side plates; and a guide that elastically support the lamp in position comprises hinges formed at the opposite ends of the guide and mounted on the bottom plate of the lamp holder in a manner that allows the hinges to rotate, an engagement member arranged at an intermediate portion of the guide and placed at an upper end of the front plate of the lamp holder and a contact member formed at the opposite sides of the engagement member and comes in

contact with the lamp.

The lamp mounting structure according to the present invention allows the lamp to be enlarged and shifted to certain extent by virtue of the structure of the lamp holder, thereby preventing the funnel or neck of the lamp from being cracked even when the lamp is heated. Accordingly, it is possible to lengthen the life of the product to which the lamp mounting structure is employed. In addition, the lamp mounting structure elastically holds the lamp by virtue of the structure of the tension guide. Accordingly, when the optical axis of the lamp is miss-aligned due to a shift of the lamp, this miss-alignment is immediately corrected. Thus, there is an advantage in that an improved stability in the operation of the product, for example, a projector, is achieved.

#### BRIEF DESCRIPTION OF DRAWINGS

The above objects, and other features and advantages of the present invention will become more apparent after a reading of the following detailed description when taken in conjunction with the drawings, in which:

Fig. 1 is an exploded perspective view illustrating a conventional lamp mounting structure;

Fig. 2 is an assembled perspective view illustrating the conventional lamp mounting structure;



Fig. 3 is an exploded perspective view illustrating a lamp mounting structure according to an embodiment of the present invention; and

5 Fig. 4 is an assembled perspective view illustrating a lamp mounting structure according to the embodiment of the present invention

#### Best Mode for Carrying Out the Invention

10 Now, preferred embodiments of the present invention will be described in conjunction with Figs. 3 and 4. In Figs. 3 and 4, elements respectively corresponding to those in Figs. 1 and 2 are denoted by the same reference numerals.

15 Referring to Fig. 3, a lamp mounting structure for a projector according to an embodiment of the present invention is illustrated. As shown in Fig. 3, the lamp mounting structure includes a lamp holder 20 for holding a lamp 10, and a return means for elastically returning the lamp 10 to an original position, where the optical axis of the lamp 10 is aligned in all directions, when the lamp 10 moves away from the original position.  
20

As mentioned above, the lamp 10 includes a funnel 12, and a frame provided at the front end of the funnel 12. Basically, the lamp holder 20 has a bottom plate 201, a front plate 202, and a pair of spaced side plates 203. In accordance with the

present invention, the distance  $L_3$  between the side plates 203 of the lamp holder 20 is slightly larger than the lateral length  $L_t$  of the frame 14 by about 1 mm. That is, the lamp holder 20 is structured to support the lamp 10 while maintaining a desired gap between the frame 14 and each side plate 203.

The return means comprises a tension guide 40 having a curved structure to surround the side and upper surfaces of the funnel 12. The tension guide 40 is hingably mounted to the bottom plate 201 of the lamp holder 20 at both ends thereof. The tension guide 40 also has an intermediate portion engaged with the front plate 202 of the lamp holder 20, and funnel and frame contact portions arranged at opposite sides of the intermediate portion and adapted to come into contact with the funnel 12 and frame 14 of the lamp 10. The tension guide 40 may be a wire member bent to have a desired shape. This tension guide 40 has material and structural characteristics capable of exhibiting a desired elasticity.

Now, the shape of the tension guide 40 will be described in detail. The tension guide 40 has a wire-shaped guide body, hinges 40a respectively provided at opposite ends of the guide body and hingably mounted to fixed members 24 fixedly mounted on the bottom plate 201, funnel contact portions 40b extending from respective hinges 40a and serving to come into contact

with the funnel 12 of the lamp 10, frame contact portions 40c extending from respective funnel contact portions 40b and serving to come into contact with the frame 14 of the lamp 10, and engagement portion 40d provided at the intermediate portion of the guide body and engaged with engagement grooves 20a formed at the upper end of the front plate 202.

The tension guide 40 is hingably mounted to the bottom plate 201 by virtue of its hinges 40a hingably mounted to the fixed members 24 fixedly mounted on the bottom plate 201. Once the lamp 10 is arranged in position in the lamp holder 20, the tension guide 40 is hingably moved to engage its engagement portion 40d with the engagement grooves 20a formed at the upper end of the front plate 202. Thus, the lamp 10 is firmly held in the lamp holder 20 by the tension guide 40.

Four contacts 41 are formed between the lamp 10 and the tension guide 40 to define the position of the lamp 10 in the lamp holder 20.

The principle of positioning the lamp 10 by the tension guide 40 will be described hereinafter.

As shown in Fig. 4, contacts 41, that is, a first contact 41a and a second contact 41b, are formed at each side of the lamp 10 between the funnel 12 and an associated one of the funnel contact portions 40b. When viewed in Fig. 4, the tension guide 40 applies a force to the lamp 10 in left, rearward, and

downward directions at the first contact 41a while applying a force to the lamp 10 in left, rearward, and upward directions at the second contact 41b. Although not shown, the force of tension guide 40 is applied to the left side of the lamp 10 in directions symmetrical to those of the force applied to the right side of the lamp 10.

The forces applied to the lamp 10 by the tension guide 40 are symmetrical in a vertical direction (the Y-axis direction in Fig. 3) and a lateral direction (the X-axis direction in Fig. 3), so that they are offset by each other. Also, the force of the tension guide 40 in a longitudinal direction (the Z-axis direction in Fig. 3) is applied to the front plate 202 of the lamp holder 20. Thus, the lamp 10 is firmly held in the lamp holder 20 in a state in which the forces applied to the lamp 10 by the tension guide 40 are balanced. When the force balance is lost due to a positional shift of the lamp 10, a return force from the tension guide 40 is applied to the lamp at the contacts 41. By virtue of the return force, the lamp 10 is immediately moved to its original position where the optical axis of the lamp 10 is aligned in all directions. Thus, a desired alignment of the optical axis of the lamp 10 can be easily achieved.

The tension guide 40 may be structured to form additional contacts 41c and 41d where the frame contact portions 40c come

into contact with the upper surface of the frame 14. In this case, a force from the tension guide 40 is downwardly applied to the frame 14 against the bottom plate 201. By virtue of this force, the lamp 10 can be more firmly held in the vertical direction.

In accordance with the lamp mounting structure having the above mentioned configuration according to the present invention, the lamp 10 is laterally movable to some extent in a state in which the frame 14 of the lamp 10 is in contact with the front plate 202 of the lamp holder 20. Accordingly, even when the funnel 12 and frame 14 are deformed to have an enlarged size or are shifted due to heat generated during the operation of the lamp 10, such a phenomenon is absorbed by the tension guide 40 by virtue of the elasticity of the tension guide 40. Accordingly, there is no occasion that the funnel 12 or neck 18 is cracked.

In particular, when the lamp 10 is shifted, thereby resulting in a miss-alignment of the optical axis thereof, the tension guide 40 applies an elastic pressure to the lamp 10 in a direction opposite to the shift direction of the lamp 10 by virtue of its structure surrounding the left and right side surfaces and upper surface of the funnel 12. Accordingly, the position of the lamp 10 is immediately corrected. Thus, the optical axis of the lamp 10 is maintained in lateral, vertical

and longitudinal directions (X, Y, and Z-axis directions).

#### Industrial Applicability

As apparent from the above description, the lamp mounting structure according to the present invention allows the lamp to be enlarged and shifted to a some extent by virtue of the structure of the lamp holder, thereby preventing the funnel or neck of the lamp from being cracked even when the lamp is heated. Accordingly, it is possible to lengthen the life of the product to which the lamp mounting structure is applied. In addition, the lamp mounting structure elastically holds the lamp by virtue of the structure of the tension guide. Accordingly, when the optical axis of the lamp is miss-aligned due to a shift of the lamp, this miss-alignment is immediately corrected. Therefore, the improved stability in the operation of the product, for example, a projector, is achieved.

Although the preferred embodiments of the invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

## WHAT IS CLAIMED IS:

## 1. A mounting structure for a lamp comprising:

5 a lamp having a funnel, a frame attached to a front end of the funnel and a connecting bolt provided at a rear portion of the funnel;

10 a lamp holder, which is adapted to hold the lamp therein while maintaining a desired lateral gap at each side of the frame of the lamp, have a bottom plate, a front plate and a pair of side plates; and

15 a guide that elastically support the lamp in position. comprises hinges formed at the opposite ends of the guide and mounted on the bottom plate of the lamp holder in a manner that allows the hinges to rotate, an engagement member arranged at an intermediate portion of the guide and placed at an upper end of the front plate of the lamp holder and a contact member formed at the opposite sides of the engagement member and comes in contact with the lamp.

20 2. The mounting structure according to claim 1, further comprising:

fixed members mounted on the bottom plate of the lamp holder to allow the both ends of the guide to be attached with a capability to rotate.

3. The mounting structure according to claim 1, wherein the contact members are arranged at opposite side portions of the funnel, respectively, so that each of them forms at least two contact points with one of the side portions of the funnel and applies an elastic force to the funnel via the contact points, thereby maintaining the lamp, in an elastic fashion, at a position where an optical axis of the lamp is aligned in all directions.

4. The mounting structure according to claim 1, wherein the guide is a shaped metal wire having an elasticity.

5. The mounting structure according to claim 1, wherein the guide further has additional contact members that extend from opposite ends of the engagement member and apply a force to the frame of the lamp in a downward direction, thereby causing the lamp to be firmly held in a vertical direction.

6. The mounting structure according to claim 1, further comprising:

engagement grooves formed at the upper end of the front plate of the lamp holder such that the engagement member of the guide may be placed in effective position.



7. A structure for mounting a lamp of a projector comprising:

5 a lamp having a funnel, a frame attached to a front end of the funnel, and a connecting bolt provided at a rear portion of the funnel;

10 a lamp holder that adapted to hold the lamp includes a pair of side plates arranged at opposite sides of the frame of the lamp while maintaining a desired lateral gap from an associated one of the opposite sides of the frame, a front plate being in contact with a front surface of the frame while applying a force to the lamp in a direction toward the lamp, and a bottom plate being in contact with a bottom surface of the frame and supporting the frame in a downward direction; and

15 a tension guide that adapted to elastically support the lamp in position includes the hinges provided at opposite ends of the guide and hingably mounted to the bottom plate of the lamp holder, contact members having at least four contact points with the funnel where the tension guide come into  
20 contact with the funnel of the lamp and engagement member, which is an extension of the contact members, arranged at an intermediate portion of the guide and engaged with an upper end of the front plate of the lamp holder.

8. The structure according to claim 7, wherein the tension guide further has additional contact members formed in between the engagement member and the contact member, and come in contact with the frame such that force is applied to the frame of the lamp in a downward direction to prevent the lamp from moving vertically.

9. The structure according to claim 8, wherein the additional contact members are placed symmetrical with each other.

10. The structure according to claim 8, wherein the tension guide is a shaped metal wire having an elasticity.

11. The structure according to claim 7, wherein the hinges and contact members of the tension guide are symmetrically arranged so that the contact points are symmetrically arranged in vertical and lateral directions with respect to the lamp.

12. The structure according to claim 7, wherein the contact members of the tension guide are formed in a circular shape so that they are in contact with four corners of the lamp.

13. A structure for mounting a lamp in a projector,  
comprising:

a lamp support adapted to support the frame of the lamp  
5 while maintaining a desired gap from the frame; and

return means having at least four contact points to apply  
an elastic force to the lamp when the lamp moves out of the  
position, thereby returning the lamp to an original position  
thereof where an optical axis of the lamp is aligned in  
10 position.

14. The structure according to claim 13, wherein the  
return means comprises:

a shaped metal wire;

15 a bottom plate included in the lamp support and adapted  
to support opposite ends of the metal wire; and

a front plate of the lamp support which allows the middle  
section of the metal wire to be placed on the upper front of  
the lamp support.

20 15. The structure according to claim 13, wherein the  
return means is mounted on the lower portion of the lamp  
support in a manner that allows the return means to rotate.

16. The structure according to claim 13, wherein the return means comprises a shaped metal wire having a laterally symmetrical shape.

5           17. The structure according to claim 13, wherein the contacts are symmetrically arranged around the lamp.

10           18. The structure according to claim 13, wherein the contacts are symmetrically arranged in a lateral direction with respect to the lamp so that the lamp receives the same force in opposite lateral directions, respectively.

15           19. The structure according to claim 13, wherein the contacts are symmetrically arranged in a vertical direction with respect to the lamp so that the lamp receives the same force in opposite vertical directions, respectively.

FIG. 1

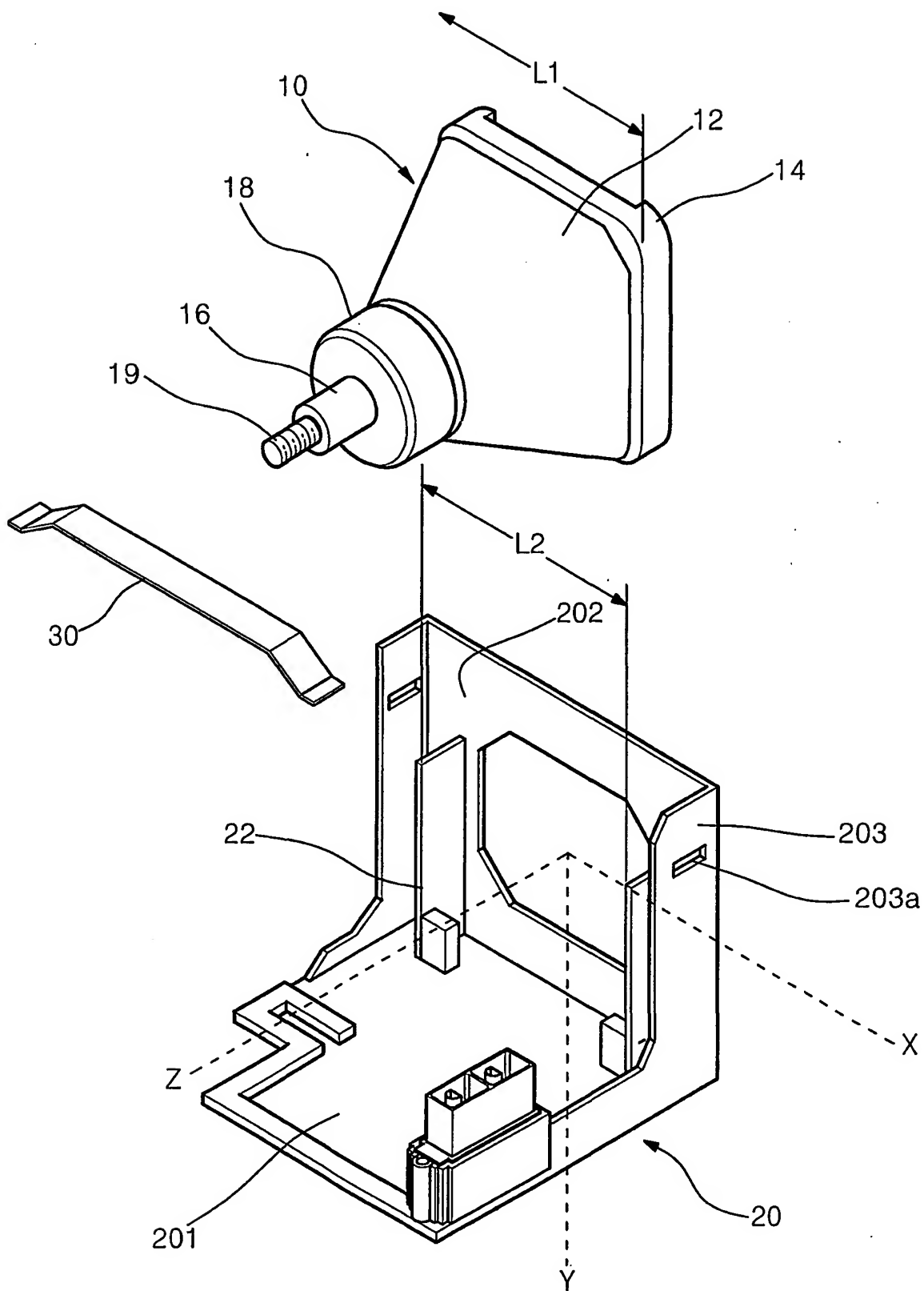


FIG. 2

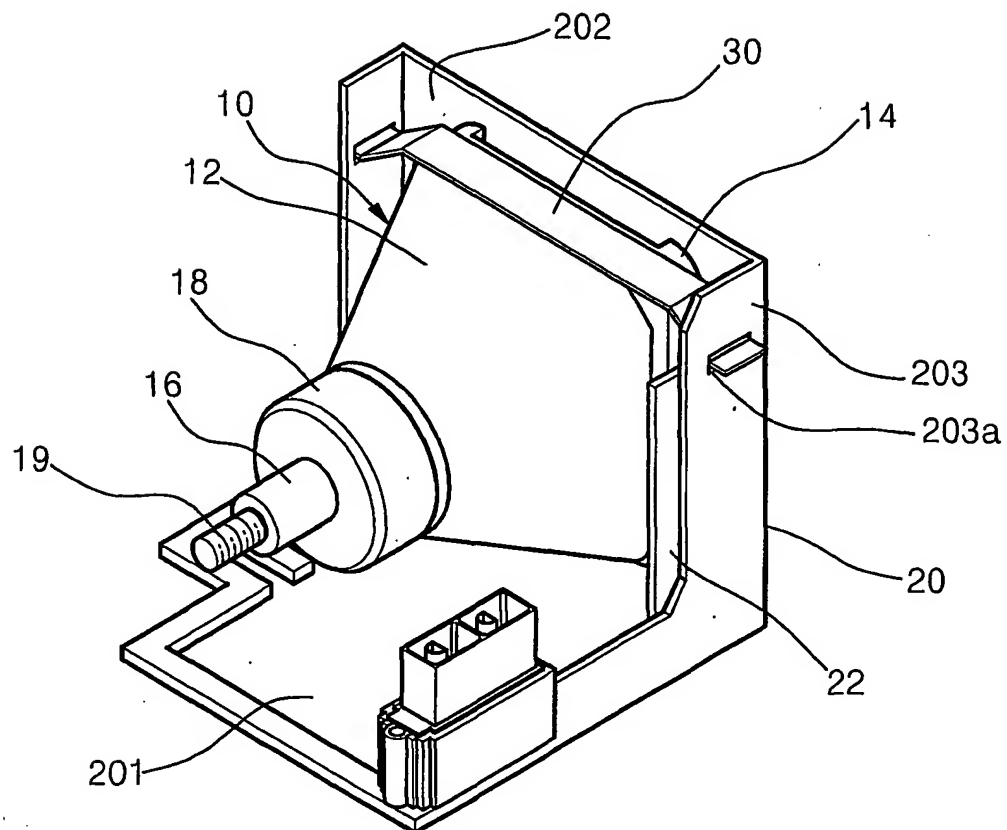


FIG. 3

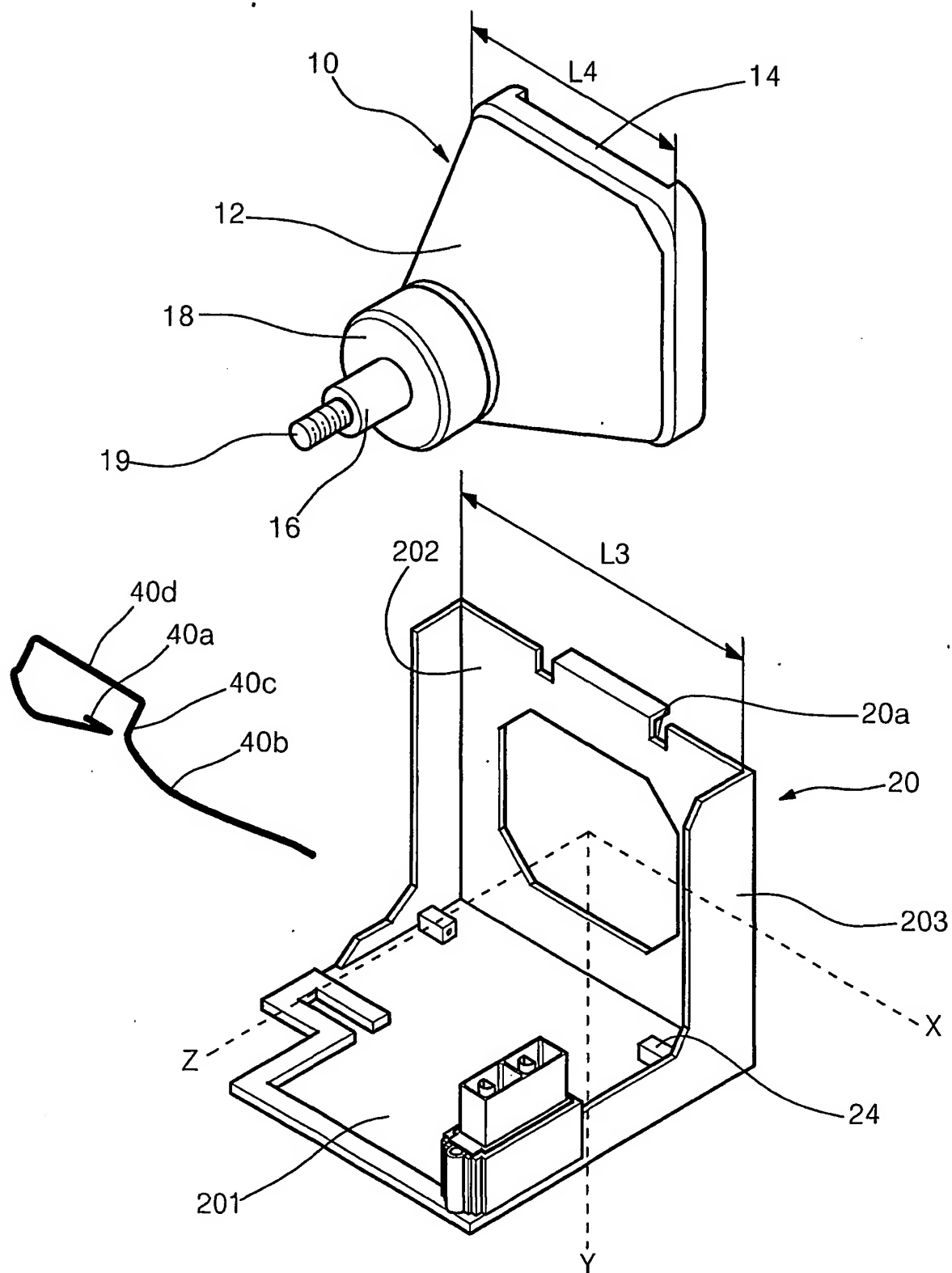
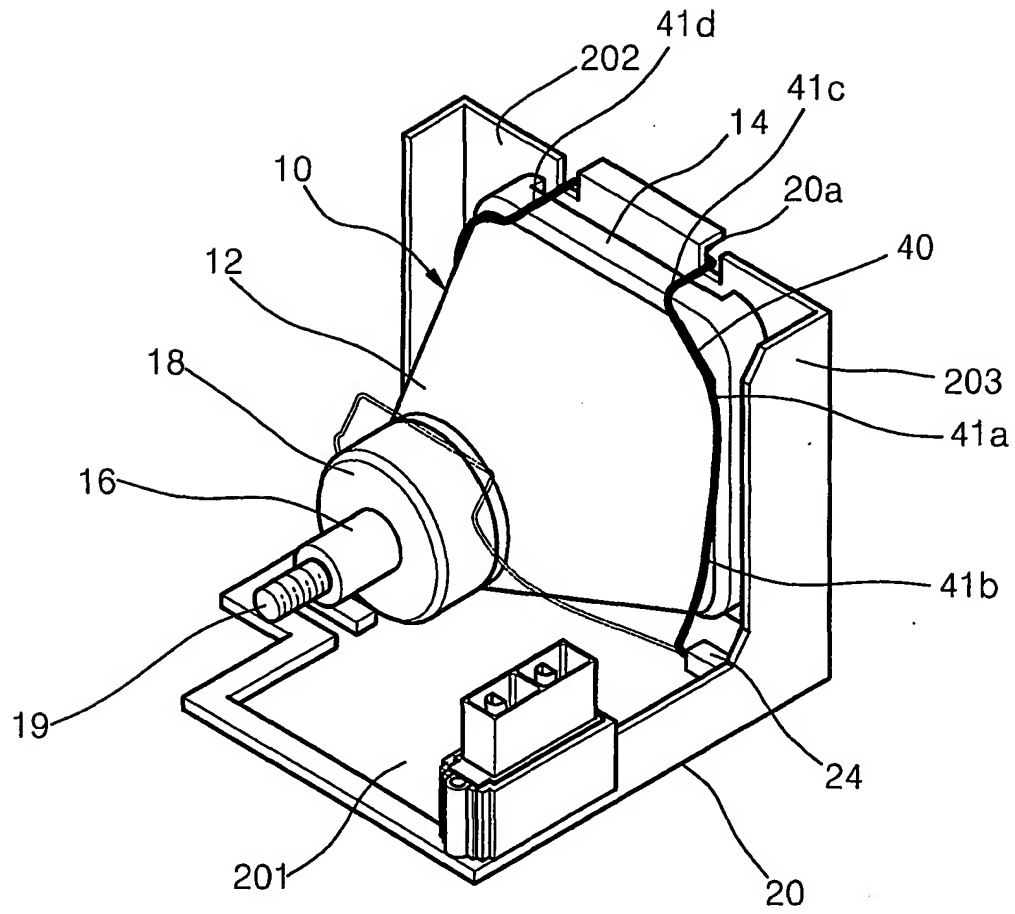


FIG. 4





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR01/01204

**A. CLASSIFICATION OF SUBJECT MATTER****IPC7 G03B 21/20**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

G03B 21/00, 21/132, 21/20

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean Patents and applications for inventions since 1975, Korean Utility models and applications for Utility models since 1975,  
Japanese Utility models and applications for Utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| A         | US 5101236A(TEXAS INSTRUMENTS INC.) 31 Mar. 1992<br>see abstract; figures 1,4      | 1-19                  |
| T         | US 6280036B1(CANON KABUSHIKI KAISHA) 28 Aug. 2001<br>see abstract; figures 9,10    | 1-19                  |

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier application or patent but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art  
"&" document member of the same patent family

Date of the actual completion of the international search

16 NOVEMBER 2001 (16.11.2001)

Date of mailing of the international search report

19 NOVEMBER 2001 (19.11.2001)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office  
Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon  
Metropolitan City 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

YOON, Byong Kuk

Telephone No. 82-42-481-5498

